

# Channel Loss (CHANLOSS) Model

## 1. Description of Algorithm

CHANLOSS model accounts for losses or gains of water that occur along a channel reach as a result of flow through the channel bottom and evaporation from the stream surface.

Even though channel losses are actually distributed along the length of the reach the Operation adjusts instantaneous discharges at a flow point for such losses.

## 2. Model Parameters

CHANLOSS uses an XML representation of model parameters where each parameter is captured within a separate XML tag. The tags are closely related to the NWSRFS definition of CHANLOSS defined at:

<https://vlab.ncep.noaa.gov/documents/207461/1893022/533chanloss.pdf>

The table below shows the available parameter tags. The sequence of parameters in the table below or in the xml file has no any significance.

Name	Type	Required [Yes/No]	Comment
SSOUT_TYPE	String	yes	Type of SSOUT used: ‘VARC’ is variable SSOUT (unit of CMS) ‘VARP’ is variable SSOUT (unit of percentage) ‘FIXC’ is constant SSOUT (unit of CMS) ‘FIXP’ is constant SSOUT (unit of percentage)
SSOUT_CONSTANT	Double	yes	Constant SSOUT loss parameter in CMS or a decimal fraction if expressed as a percentage. <i>If SSOUT_TYPE set to FIXP or FIXC, then SSOUT_CONSTANT is used.</i>
SSOUT_VARIABLE	Table	yes	If SSOUT_TYPE set to VARC or VARP, then SSOUT_VARIABLE is used.
WATER_SURFACE_AREA	Double	yes	Water surface area of channel system in KM2

LONG_TERM_AVE RAGE_EVAPORATI ON	Table (12rows)	yes	Long-term average evaporation values (Ea) or seasonal adjustment factors (EMO) on the 16th of each month (January through December); if PE time series used then values represent EMO; otherwise the values are Ea in MM/day <i>If WATER_SURFACE_AREA is greater than 0.0 then this parameter Id is applied.</i>
PE_ADJUSTMENT	Double	yes	Constant evaporation adjustment factor <i>If WATER_SURFACE_AREA is greater than 0.0 then this parameter Id is applied.</i>
DAILY_EVAPORAT ION_DISTRIBUTIO N_TYPE	String	yes	Type of daily evaporation distribution: ‘DIUR’ is diurnal ‘EVEN’ is uniform <i>If WATER_SURFACE_AREA is greater than 0.0 then this parameter Id is applied.</i>
INPUT_MAPE	String	yes	YES – use MAPE input time series. NO – unused MAPE input time series. <i>If WATER_SURFACE_AREA is greater than 0.0 then this parameter Id is applied.</i>

Sample Parameters xml file:

```

<parameter id="SSOUT_TYPE">
  <stringValue>FIXP</stringValue>
</parameter>
<parameter id="SSOUT_CONSTANT">
  <dblValue>0.0</dblValue>
</parameter>
<parameter id="WATER_SURFACE_AREA">
  <dblValue>7.3</dblValue>
</parameter>
```

```

<parameter id="INPUT_MAPE">
    <stringValue>NO</stringValue>
</parameter>
<parameter id="PE_ADJUSTMENT">
    <dblValue>1.0</dblValue>
</parameter>
<parameter id="LONG_TERM_AVERAGE_EVAPORATION">
    <table>
        <columnTypes A="double"/>
        <row A="0.19"/>
        <row A="0.79"/>
        <row A="1.2"/>
        <row A="1.8"/>
        <row A="2.8"/>
        <row A="3.9"/>
        <row A="4.9"/>
        <row A="4.3"/>
        <row A="2.8"/>
        <row A="1.4"/>
        <row A="0.59"/>
        <row A="0.19"/>
    </table>
</parameter>
<parameter id="SSOUT_VARIABLE">
    <table>
        <columnTypes A="double"/>
        <row A="0.0"/>
        <row A="0.0"/>
    </table>
</parameter>
<parameter id="DAILY_EVAPORATION_DISTRIBUTION_TYPE">
    <stringValue>EVEN</stringValue>
</parameter>

```

### 3. Model States

CHANLOSS model states are defined in a property file format. An example is shown below. The model state property names are:

Property Name	Description
---------------	-------------

LAST_PE_VALUE <sup>1</sup>	The PE time series value at the end of the previous run [mm]
UNIT	Units for State Variables (always METRIC)

An example is shown below.

```
UNIT=METRIC
LAST_PE_VALUE=5.40414
```

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<sup>1</sup> Only used when CHANLOSS uses a PE input time series.

## 4. Model Time Series

CHANLOSS requires minimum 1 input time series, a maximum of 2 input time series, and 1 output time series.

Time Series Type	Internal Model Units	Time Step	Input or Output	Missing Values Allowed	Required [Yes or No]
Instantaneous Discharge	CMS	any	Input and Output	No	Yes
Potential ET (MAPE)	MM	24	Input	No	No

## 5. Modification (Mods)

- The instructions for configuring a GUI for the CHANLOSS changes below that only works on the Java version of CHANLOSS model. There are two types of modifier to make change the CHANLOSS parameter mods for
  - 1. Forecast runs uses **moduleParameterModifier** type
  - 2. Forecast and Calibration runs use **multipleModuleParameterModifier** type

**Note:** **multipleModuleParameterModifier** is not supported outside the SA environment. For calibration mode, you can use “**export**” button to export the adjusted model parameters as an xml file to a user-define directory.

### RegionConfigFiles/ModifierTypes.xml

#### 1) moduleParameterModifier:

- Add lines below to before the **<unitHydrographModifiers>** tag.

```
<moduleParameterModifier id="chanloss" name="CHANLOSS_PARAM">
    <expiryTimeDeletedModifiers unit="week" multiplier="1"/>
    <filter>
        <moduleParameterId>SSOUT_TYPE</moduleParameterId>
        <moduleParameterId>SSOUT_CONSTANT</moduleParameterId>
        <moduleParameterId>SSOUT_VARIABLE</moduleParameterId>
        <moduleParameterId>WATER_SURFACE_AREA</moduleParameterId>
        <moduleParameterId>DAILY_EVAPORATION_DISTRIBUTION_TYPE</moduleParameterId>
        <moduleParameterId>PE_ADJUSTMENT</moduleParameterId>
        <moduleParameterId>LONG_TERM_AVERAGE_EVAPORATION</moduleParameterId>
            <moduleParameterId>INPUT_MAPE</moduleParameterId>
        </filter>
        <defaultValidTime/>
        <overwriteParameterValues>true</overwriteParameterValues>
    </moduleParameterModifier>
```

- GUI to make changes CHANLOSS parameters mod.

The screenshot shows a software interface for modifying parameters. At the top, there is a toolbar with buttons for 'Create mod' and 'CH'. Below the toolbar is a vertical list of parameter names: AESCCHNG, CHANLOSS\_PARAM (highlighted with a red box), CHGBLEND, HECRAS, IGNORETS, MFC, QPCSHIFT, RAINSNOW, ROCHNG, RRICHNG, SACBASEF, SACCO, SETMSNG, TSCHNG, UADJ, UNITHG, WEADD, and WECHNG. The main workspace displays the 'Modifier Properties: CHANLOSS\_PARAM' dialog. On the left, a tree view shows selected sites: CIMARRON 10 and SPRINGER (both checked). The right side of the dialog contains tabs for 'Create mod', 'CHGBLEND', 'SACBASEF', 'SACCO', 'RRICHNG', 'UNITHG', 'Import', 'Export', and 'Re-run'. The 'Modifiers' tab is active. In the center, the 'Name' field is set to 'CHANLOSS\_SPGN5\_CRCN5\_UpdateStates'. The 'Valid time' is set to '07-09-2015 12:00'. Below these fields is a table titled 'Parameter files' showing three entries: CHANLOSS\_SPGN5\_CRCN5\_UpdateStates, CHANLOSS\_SPGN5\_CMMN5\_UpdateStates, and CHANLOSS\_SPGN5\_CMNRN5\_UpdateStates. A detailed table for 'SSOUT\_VARIABLE' lists parameter settings:

Parameter Id	Modified Value	Original Value
SSOUT_CONSTANT	0	0
SSOUT_TYPE	VARC	VARC
WATER_SURFACE_AREA	0	0
INPUT_MAPE	NO	NO
SSOUT_VARIABLE	Table ...	Table ...
LONG_TERM_AVERAGE_EVAPOR...	Table ...	Table ...
PE_ADJUSTMENT	0	0
DAILY_EVAPORATION_DISTRIBUTI...	EVEN	EVEN

At the bottom of the dialog are buttons for 'Map', 'Plots', 'Topology', 'Modifiers', 'Forecaster help viewer', and a close button 'X'.

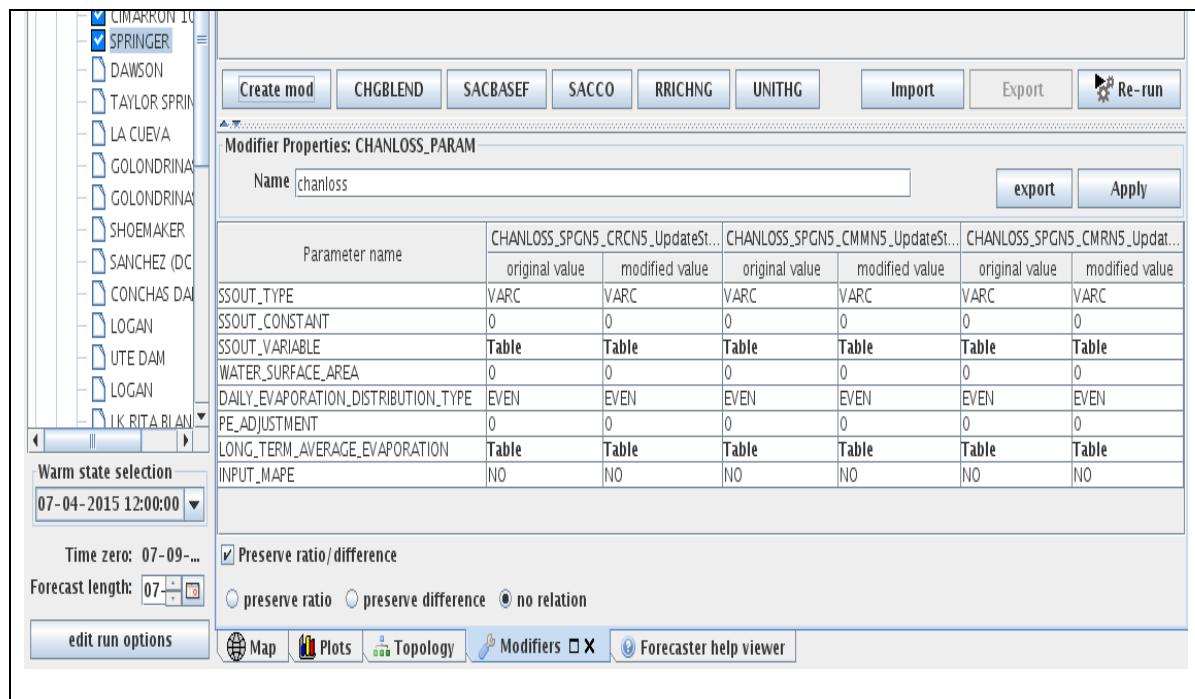
## 2) multipleModuleParameterModifier:

- Add lines below to after the </moduleParameterModifier> tag.

```
<multipleModuleParameterModifier id="chanloss" name="CHANLOSS_PARAM">
    <expiryTimeDeletedModifiers unit="week" multiplier="1"/>
    <numberParameter id="SSOUT_TYPE"/>
    <numberParameter id="SSOUT_CONSTANT"/>
    <numberParameter id="SSOUT_VARIABLE"/>
    <numberParameter id="WATER_SURFACE_AREA">
        <minimumValue>0.0</minimumValue>
    </numberParameter>
    <numberParameter id="DAILY_EVAPORATION_DISTRIBUTION_TYPE"/>
    <numberParameter id="PE_ADJUSTMENT"/>
    <numberParameter id="LONG_TERM_AVERAGE_EVAPORATION"/>
    <numberParameter id="INPUT_MAP"/>
    <hideParameters>
        <parameterId>OPERATION_CONTENTS</parameterId>
    </hideParameters>
</multipleModuleParameterModifier>
```

- GUI to make changes CHANLOSS parameters mod.

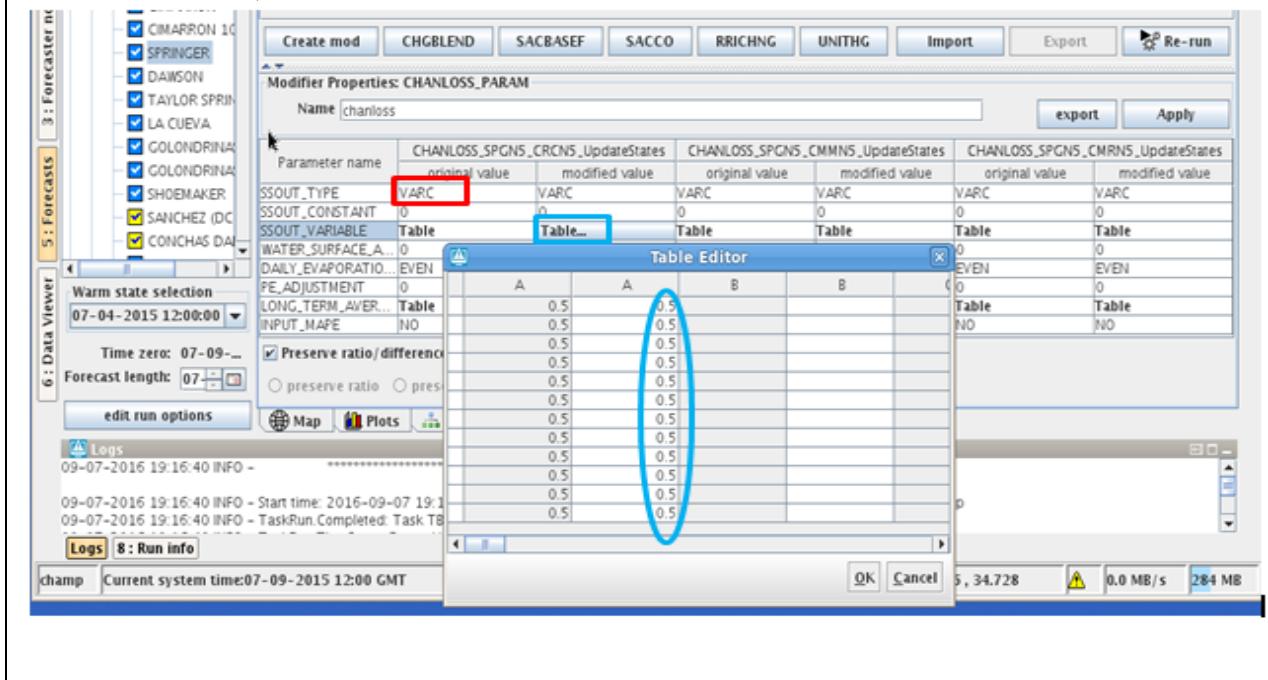




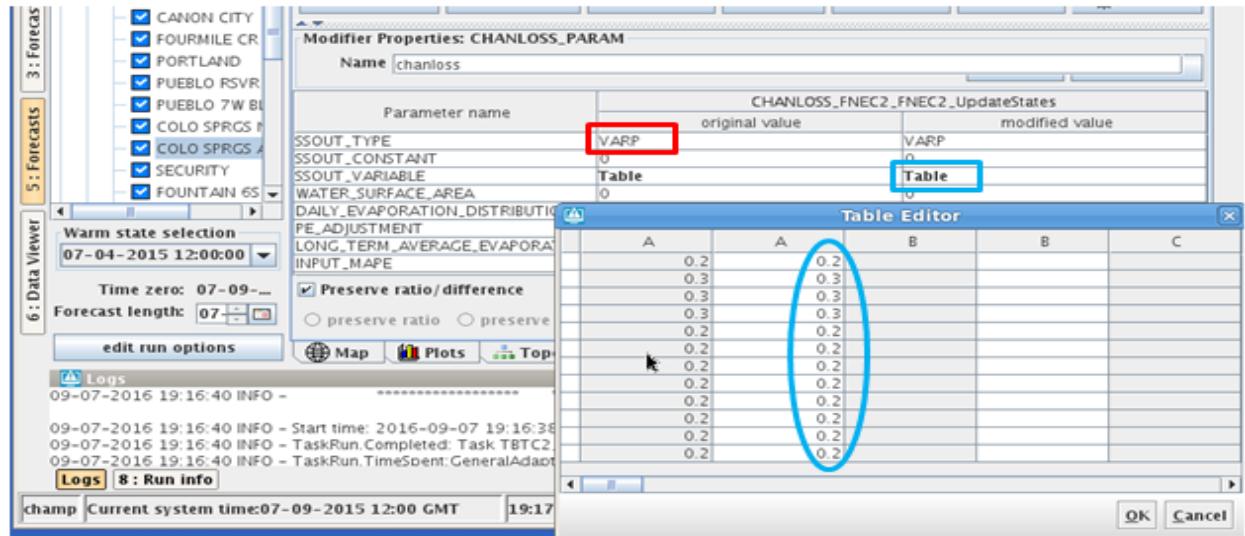
- There are some scenarios for modification CHANLOSS parameters.

**1) If an existing location is already configured to use variable SSOUT unit in CMS or percentage, then modify the parameterId values as follows:**

1. Modify **SSOUT\_VARIABLE** table values unit in CMS (SSOUT\_TYPE should be **VARC**)

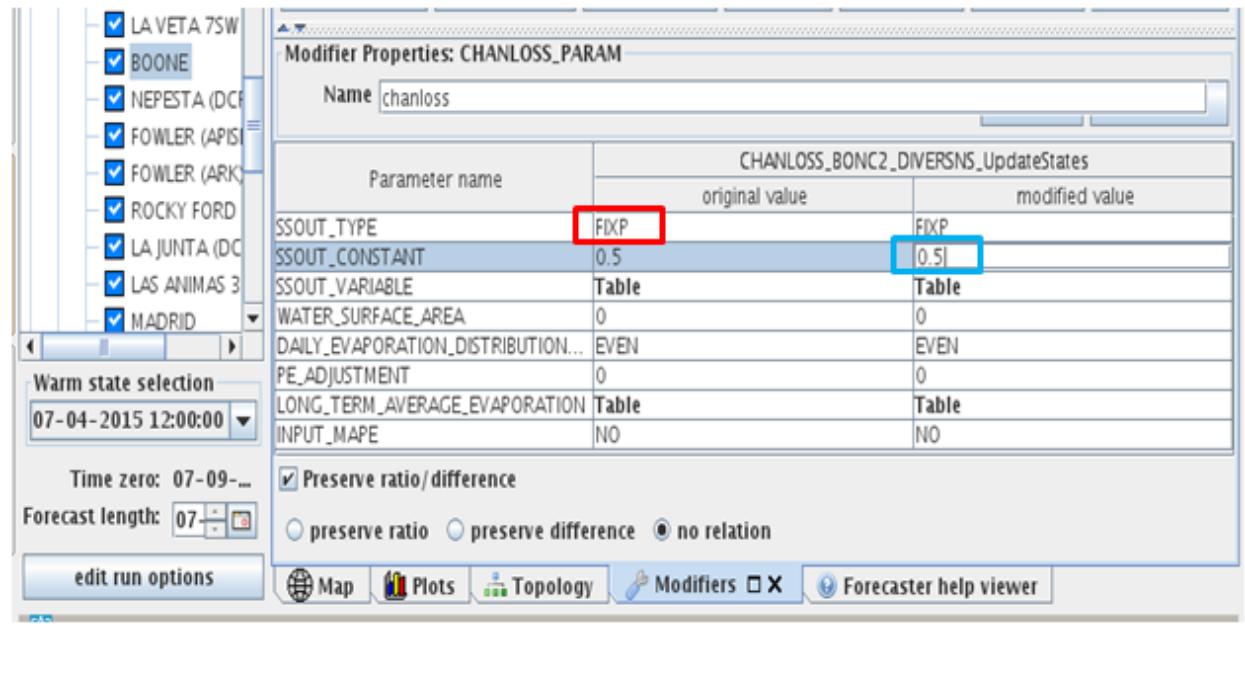


2. Modify **SSOUT\_VARIABLE** table values unit in percentage (SSOUT\_TYPE should be **VARP**)



- 2) If an existing location is already configured to use constant SSOUT unit in CMS or percentage, then modify the parameterId value as follows:

1. Modify **SSOUT\_CONSTANT** value unit in percentage (SSOUT\_TYPE should be **FIXP**)



2. Modify **SSOUT\_CONSTANT** value unit in CMS (SSOUT\_TYPE should be **FIXC**)

Modifier Properties: CHANLOSS_PARAM		
Name	chanloss	export
	Parameter name	CHANLOSS_SYRK1_SYRK1_UpdateStates
		original value modified value
SSOUT_TYPE	<b>FIXC</b>	FIXC
SSOUT_CONSTANT	0.15	<b>0.15</b>
SSOUT_VARIABLE	Table	Table
WATER_SURFACE_AREA	0	0
DAILY_EVAPORATION_DISTRIBUTION_TYPE	EVEN	EVEN
PE_ADJUSTMENT	0	0
LONG_TERM_AVERAGE_EVAPORATION	Table	Table
INPUT_MAPE	NO	NO

3) If an existing location is already configured the **WATER\_SURFACE\_AREA** is greater than 0.0, then modify the parameterIds as follows:

1. Modify **DAILY\_EVAPORATION\_DISTRIBUTION\_TYPE** type to “**DIUR**” or “**EVEN**”

Modifier Properties: CHANLOSS_PARAM		
Name	chanloss	export
	Parameter name	CHANLOSS_GSP02_GSP02_UpdateStates
		original value modified value
SSOUT_TYPE	FIXP	FIXP
SSOUT_CONSTANT	0.1	0.1
SSOUT_VARIABLE	Table	Table
WATER_SURFACE_AREA	<b>26.1</b>	<b>26.1</b>
DAILY_EVAPORATION_DISTRIBUTION_TYPE	EVEN	<b>EVEN</b>
PE_ADJUSTMENT	1	1
LONG_TERM_AVERAGE_EVAPORATION	Table	Table
INPUT_MAPE	YES	YES

2. Modify PE\_ADJUSTMENT value.

Parameter name	CHANLOSS_GSPO2_GSPO2_UpdateStates	
	original value modified value	
SSOUT_TYPE	FIXP	FIXP
SSOUT_CONSTANT	0.1	0.1
SSOUT_VARIABLE	Table	Table
WATER_SURFACE_AREA	26.1	26.1
DAILY_EVAPORATION_DISTRIBUTION_TYPE	EVEN	EVEN
PE_ADJUSTMENT	1	1
LONG_TERM_AVERAGE_EVAPORATION	Table	Table
INPUT_MAPE	YES	YES

3. Modify LONG\_TERM\_AVERAGE\_EVAPORATION table values

Parameter name	CHANLOSS_GSPO2_GSPO2_UpdateStates	
	original value modified value	
SSOUT_TYPE	FIXP	FIXP
SSOUT_CONSTANT	0.1	0.1
SSOUT_VARIABLE	Table	Table
WATER_SURFACE_AREA	26.1	26.1
DAILY_EVAPORATION_DISTRIBUTION_TYPE	EVEN	EVEN
PE_ADJUSTMENT	1	1
LONG_TERM_AVERAGE_EVAPORATION	Table...	Table...
INPUT_MAPE	YES	YES

A	A	B	B	C
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			
1.0	1.0			

## **6. Notes about configuring Model in FEWS workflow**

The variable loss algorithm uses local standard time to compute the fraction of 24 hour MAPE to use, so run info xml file should be configured to use a local time zone code (e.g. -6.0 for CST).

Examples:

Module Configuration File

[ModuleConfigFiles\CHANLOSS\\_DLWO2P\\_DLWO2P\\_Forecast.xml](#)

Module Parameter File

[ModuleParFiles\CHANLOSS\\_DLWO2P\\_DLWO2P\\_UpdateStates.xml](#)

## **7. FEWS Adapter Used**

The Channel Loss model uses the OHDFewsadapter to communicate.

Information about this adapter can be found at [OHDFewsadapter](#).